CHAPTER 7 Output Device Commands

This chapter documents the graphics devices supported by DATAPLOT. In addition, it documents some commands for setting the attributes of devices.

DATAPLOT currently supports the following graphics devices on all implementations:

- Tektronix terminals (most models, also many terminals and workstations can run in a Tektronix emulation mode)
- Regis (protocol used by many Dec terminals)
- HP-GL plotters (emulated by many penplotter vendors)
- HP 2623 and related terminals
- Postscript (color Postscript supported, encapsulated Postscript supported)
- QMS laser printers (using Quic protocol)
- GENERAL (a DATAPLOT specific metafile)
- CGM (ANSI standard for graphics metafiles, currently only the clear text encoding is supported)
- alphanumeric terminals (only character type graphics are generated)

The following graphics devices are supported on some installations. However, these use vendor supplied libraries. This means they require that the vendor library be available locally and that the local implementor has activated the relevant code.

- Calcomp plotters (emulated by many pen plotter vendors)
- Zeta plotters
- X11 workstations
- Sun workstation (uses Sun implementation of CGI, the proposed draft standard for a low level graphics library)

General considerations

1. DATAPLOT supports 3 devices (defined by DEVICE 1, DEVICE 2, and DEVICE 3). Device 1 output is sent to the screen and device 2 output is sent to a file (DPPL1F.DAT or dppl1f.dat on most systems). Device 3 output is also sent to a file (DPPL2F.DAT or dppl2f.dat on most systems), but it only contains the most recent plot (the PP command, documented in the Support chapter, can be used to print the device 3 output from within a DATAPLOT session). DATAPLOT supports all 3 devices simultaneously if desired (that is, a single PLOT command can generate both the plot on the screen and also write the plot to a file for later printing). The default is for device 1 to be a Tektronix 4014, device 2 to be off, and for device 3 to be a Postscript printer.
2. Although DATAPLOT is designed to be device independent, there are several ways in which graphics output is device dependent. Specifically:

   - The size and appearance of hardware generated characters varies on graphic devices. Some, such as Postscript, allow hardware characters to be scaled to any size while others, such as a Tektronix 4014, have only a few specific hardware sizes. In addition, some devices can generate typeset quality hardware characters (e.g., Postscript) while others generate low quality hardware characters. Some devices provide a wide variety of fonts. DATAPLOT provides device specific commands to access

these fonts for a few devices (Postscript, QMS, X11). If device independence is critical, use software characters. See the documentation for the FONT command in the Diagrammatic Graphics chapter for more details on software characters.

- DATAPLOT draws all line dash patterns in hardware. The number and appearance of dash patterns varies among graphics devices. DATAPLOT does not provide an option for drawing dash patterns in software.
- Devices vary in the number of colors that they support (from black and white only to full RGB specifications). For device independence, all devices recognize the same color names and indices. However, devices that do not support a given color will map it to the closest available color (closest is somewhat arbitrary) on that device. See the Color chapter for a list of supported colors and indices.
- DATAPLOT draws thick lines in hardware if the device supports it. It draws multiple lines that effectively simulate thick lines for devices that do not support hardware line thickness.
- DATAPLOT fills regions in hardware if the device supports it. It fills regions by drawing lines for devices that do not support hardware fills. This only applies to solid area fills. Cross hatch patterns are generated in software for all devices.
- Software characters can be rotated to any arbitrary angle when plotting text. See the documentation for the ANGLE command in the Diagrammatic Graphics chapter for more details on drawing text at an angle. However, hardware characters are currently limited to either a horizontal orientation or a vertical (i.e., 90 degrees) orientation. Horizontal characters are handled in the same manner on all devices. However, vertical strings can be drawn in one of two ways depending on the device. On some devices that can rotate characters (Postscript, some plotters), the entire string is rotated 90 degrees counter clockwise. On devices that cannot rotate hardware characters, vertical strings are drawn as a sequence of single horizontal characters down the page.

The external and on-line documentation for a given device specifies which of the above applies for that device (i.e., how many colors are supported, available line types, hardware fill availability, thick lines in hardware or software).

3. Requests for additional device drivers are handled on a case-by-case basis. The two primary considerations are the popularity of the device (e.g., Postscript and X11 are available on a large number of platforms) and whether or not we have access to a device of that type. Currently, a native mode IBM/PC device driver is nearly completed. Devices currently under consideration are: OpenGL, binary CGM, Display Postscript, the Graphical Kernel System (GKS) library, and PBM (Extended Portable Bitmap Toolkit from Jeff Poskanzer). This list is subject to change.
4. In addition to the built-in device drivers, there are several versions of a post-processor. See the documentation for the GENERAL device for more details.

   There are several programs that convert Postscript output. Of particular note is the ghostscript/ghostview program. Specifically, the IBM/PC version of ghostscript can be used to support various printers common on the PC, such as the LaserJet II and dot matrix printers. See the documentation for the POSTSCRIPT device for more details.
5. When first initiating a DATAPLOT session, it is typical to set the desired graphics devices. For example, to set the graphics devices if you are running DATAPLOT on a Unix workstation that supports X11 and that has a Postscript printer available, enter the following commands:

   ```
   DEVICE 1 X11
   DEVICE 2 POSTSCRIPT
   ```

   If your printer is a color Postscript printer, enter the following commands:

   ```
   DEVICE 2 POSTSCRIPT
   DEVICE 2 COLOR ON
   ```